

With the result of this small survey in mind, I decided to fluoroscope or x-ray every patient entering my office no matter what the original complaint might be.

This was begun in October, 1941, and since that time 250 patients have been submitted to examination. The fluoroscope has been used chiefly because of its ready availability and its low cost of operation. X-rays were taken of all chests which showed suspicious lesions on the fluoroscopic examination, and further attempts at diagnosis were made on suspicious cases by studying sputum, sedimentation rate, and history.

Seven active cases of pulmonary tuberculosis were discovered in this group of 250 patients, or an incidence of 2.8 per cent. One of these was missed entirely by fluoroscopic examination, and was picked up by the patient's local physician by means of an x-ray plate. A number of x-rays were taken for fluoroscopically suspicious lesions, which the roentgenogram proved to be non-tuberculous in nature. Such error is, of course, not vital, but it is important not to allow active cases to slip through undiagnosed.

This series of cases is as yet too small to justify breaking it down into groups of ages and complaints, or to draw conclusions as to percentages, but these seven active cases of tuberculosis were found in patients varying in age from 18 to 57. None of these cases gave a history of close contact with tuberculosis, and only one person suspected it. Four out of seven had positive sputum, while the other three had x-ray evidence of disease and increased sedimentation rates. In six of these seven cases, the chest was negative to ordinary physical examination, as interpreted by myself. In five cases there was no history that would have led me to suspect pulmonary disease.

In the seven previous years of general practice, I had discovered five active cases of pulmonary tuberculosis; an inquiry made of other doctors in general practice in this community indicates that they discover one or at the most two cases a year which they diagnose as active disease needing treatment. An inquiry addressed to the same physicians indicates that approximately 30 per cent of the general population consults some physician during the year for some complaint.

If we assume that the percentage of incidence of clinically significant tuberculosis is 1 per cent in the general population of Marin County, there are approximately 500 cases existing at the present time. If the present ratio of 2.8 per cent active cases found in a general practice should continue to hold good, then in the 15,000 patients who consult a doctor yearly, there should be about 400 cases of tuberculosis, or about four-fifths of the active disease in the community.

Here then is a fertile field for mass surveys. These people come to doctors because they feel they need medical aid. No problem of education or persuasion exists in getting proper chest examination, if the cost can be kept down. Con-

trast this with the efforts to get Union, industrial, and school groups educated to the point where a large proportion of their members will submit to examination, even though this examination is free. Thus it certainly seems that an effort should be made to survey this group of patients who are already seeking medical advice.

The means for doing routine chest examinations will vary, beginning doubtless with the use of the fluoroscope in the doctor's own office. Some further provision for x-rays of suspicious chests will need to be devised. The procedure will remove tuberculosis from the complete responsibility of the State and place it on the patient and his own physician, to the advantage of the patient in that his disease will be found early when prospect of cure is greater.

THE TREATMENT OF PULMONARY CAVITATION DUE TO COCCIDIOIDAL INFECTION *

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THE occurrence of pulmonary cavitation in association with primary coccidioidal infection has been described by Farness and Mills,¹ Carter,² Powers and Starks,³ and Winn.⁴ It is now evident that such cavitation is a part of, or residual to the pulmonary involvement produced by primary coccidioidomycosis. There should be no confusion with coccidioidal granuloma, which remains a relatively uncommon disease in which cavitation of this type is unusual.

During the acute pulmonary stage of primary coccidioidomycosis these cavities may appear and disappear in a comparatively short time. On the other hand, there is a marked tendency for them to persist, long after the acute pulmonary reaction has subsided, as residual, thin-walled, cyst-like structures.

These latent cavities continue to serve as reservoirs for the continued growth of the fungus, *C. immitis*, in its parasitic phase, manifested by the presence of endosporulating spherules within the sputum or contents of the gastric wash.

Coccidioidal cavities are usually solitary but may be multiple and occur in any area of the lungs. By fluoroscopy alone they serve as easily identified landmarks of the previous primary coccidioidal infection. Their usual thin-walled, "burned-out" appearance, with little or no surrounding parenchymal reaction has been so characteristic that we venture a diagnosis of coccidioidal cavity based upon the roentgenographic appearance alone.

Confirmation of the diagnosis is arrived at in

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the following manner:

(1) A suggestive medical history of residency of several weeks or more within the San Joaquin Valley or other known endemic areas. The frequent occurrence of single or repeated hemoptyses (nine out of 17 cases). Repeated episodes of productive cough are common, associated with chest pain of pleuritic type. The occurrence of erythema nodosum or multiforme in the past history is unusual. A striking feature in most of these patients is the lack of severe constitutional symptoms. They usually appear quite well and come to the clinic only because of hemoptysis, frequent "colds," chest pain or because of a chance roentgenogram disclosing the pulmonary lesion.

(2) Intracutaneous tests are then made using 0.1 cc. of coccidioidin in dilutions of 1:10,000 down to 1:100 inclusive. The test is exactly the same as the Mantoux procedure and is interpreted by the same standards with the exception that the peak of the reaction occurs in 36 hours. Routine tuberculin tests are also done, using freshly prepared solutions of Old Tuberculin or Purified Derivative down to and including the 1:100 dilution or the second strength. Extreme care is used in keeping separate the syringes, needles and sterilizing pans used for tuberculin from those used for coccidioidin skin testing. All cavity cases react to coccidioidin by the intracutaneous test.

(3) Sputum is often scanty in amount and may only occur during periods of respiratory infection or "colds." The chronic production of mucoid sputum also occurs but the amount is usually small. When sputum production is not obvious one may resort to gastric lavage. During acute primary coccidioidal infection sputum is usually a constant feature early in the illness but often disappears entirely long before the pulmonary lesion has cleared. It has been possible to isolate *C. immitis* from the pulmonary secretions in all 17 of our cases through the kind coöperation of Dr. C. E. Smith and his assistants of the department of Public Health at the Stanford Medical School. In each instance they have been able to confirm their findings by cultural and animal studies.

(4) This laboratory has also carried out our serologic studies. By using coccidioidin as an antigen they were able to demonstrate circulating antibodies in 15 of the 17 cases. We have considerable confidence in this particular laboratory test, having never obtained a false positive reaction, although we have sent a goodly number of serums as controls from conditions other than coccidioidomycosis, including tuberculosis, pneumonia and various miscellaneous disorders.

Having confirmed the diagnosis and, having ruled out tuberculosis which may be closely simulated, one must proceed with conservatism in any treatment directed toward such cavitation. Coccidioidal cavitation is practically always to be considered a part of the primary infection, either accompanying or residual to it. Primary coccidioidomycosis is very easily arrested within

the human body and only occasionally goes on to dissemination. The application of the rigid code of treatment used in dealing with pulmonary cavitation associated with tuberculous infection, is unnecessary. Persistent pulmonary hemorrhage or the occasional large cavity associated with constant production of spherule-laden sputum, may be indications for collapse measures. Pneumothorax has been used, with success, in two of our cases because of excessive bleeding. Another patient with a large thick-walled cavity who had two to three drams of positive sputum daily, has had pneumothorax for two years and still has spherules in his sputum although the cavity can no longer be visualized within the relaxed lung. In this particular case, however, we are now trying our best to re-expand the lung because of the continued existence of a fairly large complicating recurrent effusion. In two other cases that were given pneumothorax over periods of 2½ years and six months respectively, cavitation has remained open. Both cavities closed spontaneously after the lungs were re-expanded. The remaining 12 cases have received no collapse treatment and have been observed over periods of from four months to four years, under normal and unrestricted living and working conditions. Of these twelve, five have closed their cavities spontaneously and the remaining seven still retain their cavities with little change in the roentgenographic appearance and without evidence of dissemination.

A "hands-off" policy is indicated toward most coccidioidal cavitation, especially when characterized by the usual latent or thin-walled roentgenographic appearance. Conservative treatment is also indicated during the acute primary phase of the pulmonary infection when accompanied by cavity formation.

It is believed that residual pulmonary coccidioidal cavitation is only an infrequent manifestation of the primary coccidioidal infection. However, it is realized that, in an unknown but not insignificant number of cases, pulmonary cavitation must occur and disappear spontaneously. As yet, we have not seen either acute or chronic dissemination of disease in any of our cavity cases, most of which have been under observation for one or more years.

CONCLUSION

(1) The first step in the treatment of pulmonary coccidioidal cavitation is to differentiate the condition from tuberculosis.

(2) Bearing in mind the association of coccidioidal cavitation with the primary coccidioidal infection, conservative treatment is indicated.

(3) Persistent pulmonary hemorrhage or the occasional large cavity associated with continued production of spherule-laden sputum may be indications for simple collapse measures.

(4) From the standpoint of public health, it is not necessary to isolate the patient or separate him long from his usual mode of living or em-

ployment. The infection is not spread from person to person.

(5) Although primary coccidioidomycosis may occasionally become a progressive disease and acutely disseminate, or, through endogenous reinfection result in chronic dissemination (coccidioidal granuloma), we have not yet in our experience seen either type of spread result from the existence of untreated coccidioidal cavities, regardless of either continued sputum containing the fungus or hemorrhage.

(6) The above is based upon the follow-up observation of 17 cases of coccidioidal cavitation. Full confirmation of these conclusions must necessarily await the study of a larger series of cases.

NOTE: 47 lantern slides were used to illustrate this paper.

REFERENCE

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DISAPPEARANCE OF THE TUBERCULIN REACTION IN CHILDREN UNDER TREATMENT FOR VARIOUS ALLERGIES*

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IN primary tuberculous infection bacillary products escape into the blood stream and produce sensitization of body tissues to bacilli and bacillary proteins. Thereafter the tissues react with inflammation and exudation and other protective effects to each reinoculation of bacilli or bacillary protein (tuberculin).

The inflammatory reaction is termed "allergy," and as found in the skin is the basis of the tuberculin reaction. This is only one portion of a many-phased immunity mechanism. Allergic reactions are somewhat labile, varying under different conditions and at different times. When the tissues have developed a high grade of immunity sensitization decreases, and the allergic response becomes less marked.

In clinical tuberculosis the patient's ability to withstand larger and larger reinoculations with decreased local inflammatory reaction is a necessity if the patient is to live. It is necessary to

understand this variation in allergy in order to interpret properly the tuberculin reaction.

The immunity is an exaggeration of normal physiologic activity. It has been generally believed that although the tuberculin reaction may differ in strength from time to time, it rarely disappears entirely. Should it disappear frequently under any given set of conditions, and should the patient at the same time maintain a satisfactory degree of health during or after its disappearance such conditions would have to be considered as probably favorable to the patient. Inasmuch as the tuberculin reaction also may disappear during the loss of immunity which occurs in an advancing disease preceding death, and under conditions of cachexia, we must understand its disappearance as being both a favorable and an unfavorable sign, according to the conditions under which its disappearance takes place.

A series of forty-two children, some of which suffered from asthma, eczema, and other allergies, and others from low energy and delayed development, is reported in which positive reactions to tuberculin became negative during the time they were being treated with a high protein, high fat, and low carbohydrate diet; regulated exercise; and a potent extract of adrenal cortex.

Since increased permeability of tissues is known to be a factor in allergy, and since there is evidence that a high state of nutrition decreased permeability and also that the adrenal cortex has the same effect, and since the ability of these patients to react to tuberculin was either lost or reduced at the same time they were being improved or relieved of their other allergies, we must conclude that the treatment produced changes in physiologic resistance which lowered the sensitization of the tissues, thus making them less prone to react to tuberculin.

Approximately 36,000 civilians were killed in air-raids in England from June, 1940, to April, 1941. During a comparable ten-month period tuberculosis took 51,000 lives in the United States. Christmas Seal funds are our "home defense" against tuberculosis.

More than three million men, women and children have died of tuberculosis in the United States during the last thirty years. Over two million more would have died during that time if the mortality rate of 30 years ago had continued to prevail.

Tuberculosis killed more Americans in 1940 than were killed in action, or died from wounds received in action, during the First World War. Christmas Seal funds are used to reduce the toll of lives taken by tuberculosis.

The United States is gradually being freed from tuberculosis. In 30 years the death rate has been cut by 75 per cent. Christmas Seals have helped to finance these victories.

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